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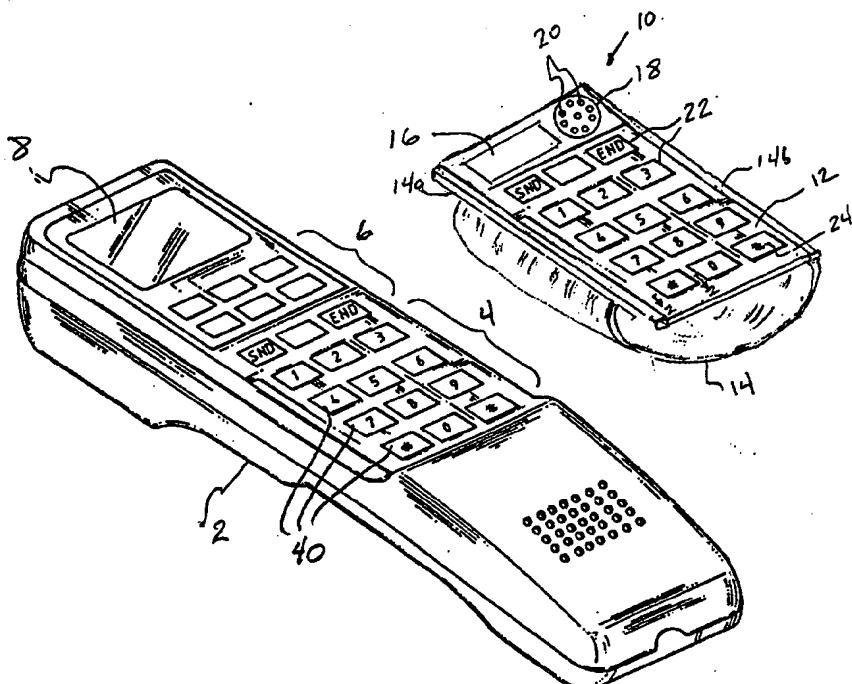
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(54) Title: SOUND EMITTING KEYPAD ACCESSORY FOR A CAR PHONE

(57) Abstract

A phone keypad device (10) useful in enunciating sounds, which correspond to designations associated with phone keys (40), the phone keys (40) being actuatable for dialing a corresponding number or function. The device (10) includes a pad (12) with a plurality of depressible overlay portions (22) aligned with the phone keys (40) beneath, a sound chip (30), and a printed circuit (50) on the underside of the pad (12) which sends signals from the overlays (22) to the sound chip (30). When a depressible overlay portion is touched, a sound is enunciated which is indicative of the phone number or function of the phone key beneath the depressible portion. If the depressible portion is further depressed, the underlying phone key (40) actuates in response for placing a call. Alternatively, a cancellation key may be actuated to prevent automatic entry of the phone number or function previously enunciated.



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SOUND EMITTING KEYPAD ACCESSORY FOR A CAR PHONE**5 CROSS-REFERENCE TO COPENDING APPLICATIONS**

This is a continuation-in-part of U.S. application No. 08/019,611. filed February 19, 1993.

BACKGROUND OF THE INVENTION

10 The present invention relates to a sound emitting keypad accessory for a car phone which enunciates a sound that is indicative of the designation of a phone number or function key. The enunciation is done before the phone number or function actually is entered for placing a call. Such an 15 accessory is described in U.S. application No. 08/019,611, filed February 19, 1993, whose contents are incorporated herein by reference. Additional embodiments are set forth in this application.

20 SUMMARY OF THE INVENTION

One embodiment of the invention relates to a phone keypad device useful in enunciating sounds, which correspond to designations associated with phone keys or phone buttons; the phone keys or phone buttons are actuatable for dialing the 25 corresponding number or function. The device comprises a housing with a keypad in a form of a plurality of touch or proximity sensitive overlays positioned so as to correspond in

of spaced apart openings in which are arranged the overlays, a sound chip, a power supply to supply power to the sound chip, a speaker, and circuit means responsive to actuation of one of 5 the overlays for enunciating by the speaker a sound derived from the sound chip. The sound which is enunciated is indicative of the designation of that one of the phone keys which is associated with and beneath the overlay actuated. The circuit means, when the overlays are actuated, is incapable of 10 generating any signal responsible for dialing the corresponding number or function at any time. The overlays are secured to the resilient pad at the openings, the pad deforming in response to depression of the overlays and resiliently returning to its undeformed state in response to release of the 15 overlays. Preferably, one power supply is secured to the pad for powering the circuit means.

Another embodiment of the invention resides in a phone keypad device useful in enunciating sounds, which correspond to designations associated with phone keys; the 20 phone keys are actuatable for dialing the corresponding number or function. The device comprises a housing with a resilient pad, a sound chip, a power supply to supply power to the sound chip, a speaker, circuit means with terminals, and a plurality of electrically conductive members individually mountable on 25 each of the phone keys and aligned with corresponding ones of the terminals. The pad deforms in response to manual pressure applied and resiliently returns to its undeformed state in response to release of the manual pressure. When the resilient pad is manually pressed against the phone keys, the circuit 30 means is responsive to the electrical contact between the conductive members and the terminals for enunciating by the speaker a sound derived from the sound chip. The sound is indicative of the designation of the phone key beneath the conductive member that established the electrical contact. The 35 circuit means, when the conductive members are actuated, does not, at anytime, generate any signal responsible for dialing the corresponding number or function, but merely produces a signal for enunciating the appropriate number or function. The

device also has means for designating locations on the pad in alignment with the phone keys.

Still another aspect of the invention resides in a phone keypad device useful in enunciating sounds, which 5 correspond to designations associated with phone keys; the phone keys are actuatable for dialing the corresponding number or function. In this embodiment, actuation of keys result in enunciation of the corresponding number or function. When the 10 next key is actuated or after passage of a predetermined time delay, the corresponding number or function of the previously actuated key is entered for placing the call unless a cancellation key is actuated in the interim. Actuation of the cancellation key cancels entry of that designation for placing the call.

15 In each of the embodiments, the user is forewarned of the designation of the phone key by enunciation prior to entering of the corresponding number for placing the call. In this manner, the user can take steps to prevent entry of the designation for placing a call after hearing the designation 20 enunciated.

BRIEF DESCRIPTION OF THE DRAWING

For a better understanding of the present invention, reference is made to the following description and accompanying 25 drawings, while the scope of the invention is set forth in the appended claims.

Fig. 1 shows a perspective view of a sound emitting keypad accessory in accordance with the invention and a portable radio or cellular phone on which the accessory fits.

30 Fig. 2 shows a cross-section taken in the direction of arrows 2-2 of Fig. 1, being representative of a first embodiment.

Fig. 3 shows a schematic circuit diagram of the invention.

35 Fig. 4 shows an exploded perspective view of a pressure contact overlay.

Fig. 5 shows a cross-section taken in the direction of arrows 2-2 of Fig. 1, but being representative of a second embodiment.

Fig. 6 shows a bottom view of the pad of Fig. 5.

5

DESCRIPTION OF THE PREFERRED EMBODIMENT

Turning to the drawings, Figs. 1 and 2 show one embodiment of the present invention. For the sake of consistency, the same reference numerals are used for like components that are found in Fig. 1 of copending U.S. application Serial No. 08/019,611, filed February 19, 1993 unless otherwise indicated.

Fig. 1 shows the accessory 10 having a preferably resilient thin pad 12 (not disclosed in Serial No. 08/019,611), 15 a battery compartment 16, a speaker compartment 18 with openings 20 above the speaker, and touch or proximity overlays 22 having an associated number or function 24. Preferably, the pad 12 is composed of two pad portions 12a, 12b (see Fig. 2) which have opposing surfaces facing each other. At least one 20 of these surfaces has recesses for accommodating therein the circuit of Fig. 3.

The top pad portion 12a may be composed of a transparent material at least immediately above the overlays, thereby permitting the overlays to be seen and their indicia 25 to be read. Otherwise, if the top pad portion 12a is opaque, indicia may be arranged on its upper surface in alignment with the overlays to designate the corresponding number or function of the phone key beneath.

Two opposite sides of the pad 12 are each secured to 30 a respective rigid metal rod 14a, b in any conventional manner, such as with epoxy. An elastic strap 14 hangs down beneath the pad 12 from each of the rods 14a, b. The phone 2 is fitted through the strap and the overlays 22 are then aligned directly over the corresponding phone buttons 40.

35 As shown in Fig. 2, the overlays 22 are in the form of a composite of a flexible conductive sheet 60, a spacer member 66 with a hole 70, and a contact member 68. The periphery of the pad portions 12a, 12b may be secured to each

other in any known manner, such as with epoxy. Further, the phone button or phone key 40 beneath each overlay 22 may abut, or come close to abutting, the underside of the pad 12. Thus, portions of the pad in the vicinity of the overlay being actuated need depress only as far as it takes for the phone key 40 beneath to actuate. The pad, therefore, deforms in the vicinity of one overlay at any given time that a phone key 40 is being depressed.

The circuit of Fig. 3 is essentially the same as that represented schematically by Fig. 3 of U.S. application Serial No. 08/019,611. Basically, flexible conductive leads extend from each of the overlay contacts to a sound chip 30, which responds to signals in the same manner as described in U.S. application Serial No. 08/019,611. Fig. 3 schematically represents a battery 26, a speaker 28, the sound chip 30, a volume control 32, and wires 34, all of which may be substantively the same as described and illustrated in U.S. Patent No. 5,140,632. Overlays 22 and some of the branch leads 50 are shown for activating each portion of the sound chip in correspondence with appropriate numbers and functions. Instead of sandwiching the printed circuit of Fig. 3 between the pad layers 12a, 12b, the printed circuit of Fig. 3 may be arranged on the underside of the lower pad layer 12b for routing the contacts associated with the overlays to the sound chip 30 in a conventional manner.

The construction of the overlays is shown in Fig. 4, which is the same as depicted in Fig. 5 of U.S. application Serial No. 08/019,611 and described therein. The overlays 22 of Fig. 1 are represented by a composite structure 36 of Fig. 4, which comprises the flexible sheet 60 having a unique indicator 62 imprinted atop an associated elastomeric conductive member 64, a spacer member 66 positioned beneath the flexible sheet 60, and a comb-configured contact member 68. The spacer member 66 has a hole 70 aligned between the elastomeric member 64 and the comb-configured contact member 68.

When the flexible sheet 60 is pressed to displace by 1-2 mm, its associated elastomeric conductive member 64 will

come into contact with the comb-configured contact member 68, thereby completing the electrical circuit between overlay contacts 44a, 44b. The operation of the overlay is analogous to that discussed in U.S. Patent No. 4,412,210.

5 In accordance with a first embodiment, the pad 12 is preferably deformable at least by an extent which allows the phone key 40 in alignment underneath the overlay to be fully depressed for dialing a corresponding number or function. Such deformation takes place in response to the application of a
10 manual pressing force exerted on the overlay towards and against (via the overlay) the phone key.

The pad 12 preferably is resilient and returns to its undeformed state when the pressing force on the overlay is released. The conductive leads have sufficient slack so as to
15 be flexible enough to displace with the deformation of the pad and yet not sever.

Alternately, the pad 12 may or may not be deformable. However, the overlay is sufficiently deformable to depress the phone key 40 underneath to a position where the phone key
20 causes signals to be generated for dialing the corresponding number or function.

A sound, which is indicative of the designation of the number or function marked on the overlay and corresponding to the designation on the underlying phone key 40, will
25 enunciate before the phone key reaches the position where signals generate for placing a call. As a result, the user is forewarned of the number or function that is about to be entered if further manual pressure is applied on the overlay to fully depress the phone key.

30 The user, therefore, has an opportunity to release the manual pressure to prevent the corresponding number or function from being entered and is thereby able to make another selection. Thus, if the enunciated sound signifies that a wrong phone key is about to be actuated if further pressed, the
35 user may release the pressure on the key so as not to press the key further to its position where signals are generated to effect dialing of the corresponding number or function. This opportunity arises because the user hears the enunciation of

the designation of the overlay that has been actuated in advance, and thereby is given the opportunity to actuate some other overlay instead. Such an opportunity is desirable where the user has touched an unintended overlay.

5 Further, this embodiment preferably is a fully self-contained unit, with all the necessary components attached to the pad. In this manner, all that needs to be done is to attach the pad on top of a face of the phone such that the overlays align with the phone keys. Such securement may be
10 done in any conventional manner.

For instance, Fig. 1 shows an elastic strap 14 hanging beneath the pad 12 which may be used to retain the pad in place over the phone keys 40 so that the overlays 22 are aligned with corresponding ones of the phone keys 40
15 underneath.

Another embodiment is shown in Fig. 5. The resilient pad 12 has no openings for holding overlays in this embodiment; instead, indicia 80 preferably appear on the top surface of the pad and designate phone number digits or functions. The
20 underside of the pad 12 has a printed circuit pattern, essentially the same as that represented schematically in Fig. 3 except that the circuit is open between sets of pairs of conductive terminals 82a, 82b of Fig. 6, each pair of terminals being aligned beneath a corresponding indicia 80, and in effect
25 replacing the actuating terminals 44a, 44b of each overlay of Fig. 5.

An electrically conductive stick-on 84 is secured on top of a conventional phone key 40 in any conventional manner, such as with an adhesive, and arranged to close a pair of the
30 terminals 82a, 82b when the pad 12 is manually pushed toward the phone key beneath. A signal is generated in response to this closing and is conducted via the printed circuit to the sound chip, which responds to effect enunciation in the same way as described in U.S. application Serial No. 08/019,611.

35 Conventionally, the distance between the centers of phone keys of a keypad may vary significantly from manufacturer to manufacturer. Such a variance in distance, however, is generally limited to be within comfortable reach of the fingers

between adjacent keys. Thus, the spacing between adjacent sets of pairs of terminals 82a, 82b is, in accordance with the invention, likewise set by such a distance so as to be within comfortable reach of fingers. The elongation of the terminals 5 82a, 82b of Fig. 6 help make the present invention accommodate variations in such spacing between adjacent conventional phone keys.

Each stick-on 84 is preferably made of a sturdy but flexible material, such as plastic, and electrically 10 conductively coated on its top face and adhesively coated on its underside for attaching to the top of phone keys of a keypad. Preferably, the stick-on may be flexed to adhere to the contour of the phone key and yet extend partially off the phone key without necessarily bending. In this manner, minor 15 variances in the relative position of the stick-on 84 with respect to the associated pair of conductive terminals 82a, 82b may be accommodated to ensure electrical contact.

One method of assembly involves aligning the center column of conductive terminals 82a, 82b with the corresponding 20 phone keys for establishing electrical connection. This electrical connection arises in response to the center column terminals being pushed down to contact the aligned stick-ons 84. The other stick-ons 84 should be aligned with other sets of pairs of terminals 82a, 82b as well. If not, the stick-ons 25 84 may be relocated so as to partially extend off the phone keys.

Instead of aligning the phone keys with raised indicia 80 on top of the pad, as in Fig. 5, it is also within the scope of the invention for the pad to be constructed of two 30 pad portions, as in Fig. 2, with the top pad portion 12a being composed of a transparent material and the overlays 22 of Fig. 2 being replaced by an opaque material marked with indicia.

Alternatively, each stick-on 84 may have an indicia on its top surface with the pad being transparent at least in 35 areas which are in alignment with the stick-ons. The terminals 82a, 82b may extend across the underside of the transparent material and be positioned for contacting the stick-ons when pressed down towards them.

Still another embodiment of the present invention relates to incorporating the enunciation circuit, such as that of Fig. 4 of U.S. Patent No. 5,140,632, integrally with a conventional phone 2 of Fig. 1, such as that which is also shown in Fig. 1 of U.S. Patent No. 5,140,632. In accordance with the present embodiment, however, the circuitry of the conventional phone is modified to integrate the circuitry of Fig. 3 so that the keys are enunciated when actuated. In addition, the conventional circuitry is modified to delay entry of the corresponding number or function of the actuated key for placing a call until the occurrence of a specific event.

Thus, for instance, actuation of a cancellation key may be one event which will prevent entry of the number or function corresponding to the enunciated key; actuation of a key associated with the next desired number or function may be another event which triggers entry of the number or function associated with the previously enunciated key. The cancellation key may be one of the function keys or perhaps an additional key on the keypad, such as the unlabeled key between the Send and End keys of Fig. 1 of the present application. Still another event might be the passage of a time delay which triggers entry of the corresponding number or function.

Conventional systems, on the other hand, enter numbers or functions as and when their associated keys are actuated. Such entry may continue until attaining a string of numbers or functions which represents the desired complete entry for placing a call. Neither the employment of a time delay before attempting to place the call nor the use of a cancellation key to remove the previously entered number or function from the string are believed known in connection with a circuit that enunciates the numbers or functions beforehand, i.e., before entering the associated number or function even as part of the string. That is, instead of cancelling an entered number or function, means are provided in accordance with the invention for preventing the previously enunciated number or function from being entered as part of the string.

While the foregoing description and drawings represent the preferred embodiments of the present invention,

it will be understood that various changes and modifications may be made without departing from the spirit and scope of the present invention.

WHAT IS CLAIMED IS:

1. A phone keypad device useful in enunciating
2 sounds, which correspond to designations associated with phone
3 keys, the phone keys being actuatable for dialing a
4 corresponding number or function, the device comprising:

5 a flexible pad adapted to be positioned over the key
6 pad of the phone;

7 a plurality of touch or proximity sensitive overlays
8 supported by said pad and corresponding in position to the
9 phone keys; and

10 circuit means responsive to actuation of one of said
11 overlays for enunciating a sound which is indicative of the
12 designation of that one of the phone keys which is associated
13 with and arranged beneath the overlay actuated, said overlays
14 being displaceable in response to manual pressure being applied
15 in a direction to displace one of said overlays toward an
16 underlying one of the phone keys so as to displace the
17 underlying one of the phone keys, said pad having a portion
18 adjacent the one overlay that is deformable in response to
19 displacement of said one overlay from the manual pressure, said
20 phone keys being actuatable only after enunciation of the sound
21 indicative of the corresponding number or function.

1. A device as in claim 1, wherein said pad is
2 composed of two layers one atop the other, at least one of said
3 layers having recesses each accommodating a respective one of
4 said overlays therein.

1. A device as in claim 2, wherein said circuit
2 means extends between said two layers.

1. A device as in claim 2, wherein one of said
2 layers that is atop the other is composed of a transparent
3 material at least immediately above the recesses.

1. A device as in claim 2, wherein one of said
2 layers that is atop the other is composed of an opaque

3 material, further comprising indicia means on said one layer
4 and being indicative of a designation for the corresponding
5 number or function of the phone key in alignment beneath.

1 6. A device as in claim 1, further comprising a
2 housing detachable from the phone, said housing including a
3 viewing portion and depending arms extending from said viewing
4 portion, said pad being interposed between said arms and
5 arranged to allow said overlays to be viewed through, said
6 viewing portion.

1 7. A device as in claim 1, wherein at least a
2 portion of said pad adjacent said overlays is manually
3 depressible from an uncompressed state to a compressed state
4 and is resilient for returning to the uncompressed state when
5 released from the compressed state.

1 8. A device as in claim 2, wherein portions of said
2 layers are manually depressible adjacent said recesses from an
3 uncompressed state to a compressed state and are resilient for
4 returning to the uncompressed state when released from the
5 compressed state.

1 9. A phone keypad device useful in enunciating
2 sounds, which correspond to designations associated with phone
3 keys, the phone keys being actuatable for dialing a
4 corresponding number or function, the device comprising:

5 a flexible pad;

6 circuit means with a plurality of terminals, said pad
7 supporting said circuit means and having portions deformable
8 adjacent said terminals in response to manual pressure directed
9 at the terminals; and

10 a plurality of electrically conductive members
11 individually mountable on each of the phone keys and aligned
12 with corresponding ones of said terminals, said circuit means
13 being responsive to electrical contact being established
14 between one of said terminals and one of said conductive
15 members for enunciating a sound indicative of a designation of
16 the aligned phone key beneath, said electrical contact being

17 established in response to the manual pressure being applied
18 to displace the one terminal into contact with the one
19 conductive member, said phone keys being actuatable only after
20 enunciation of the sound.

1 10. A device as in claim 9, further comprising a
2 housing detachable from the phone, said housing including a
3 viewing portion and depending arms extending from said viewing
4 portion, said pad being interposed between said arms and
5 arranged to allow said overlays to be viewed through said
6 viewing portion.

1 11. A device as in claim 9, wherein at least a
2 portion of said pad adjacent said conductive members is
3 manually depressible from an uncompressed state to a compressed
4 state and resilient for returning to the uncompressed state
5 when released from the compressed state.

1 12. A device as in claim 9, further comprising:
2 indicia means for designating locations on said pad
3 in alignment with the phone keys that are indicative of the
4 corresponding number or function of the phone keys.

1 13. A device as in claim 9, wherein said
2 electrically conductive members each include means for adhering
3 to the phone keys and indicia means indicative of the
4 corresponding number or function of the phone key in alignment
5 underneath, said pad being composed of a transparent material
6 at least at locations immediately above said indicia means.

1 14. A phone keypad device useful in enunciating
2 sounds, which correspond to designations associated with
3 individual phone keys, the phone keys being actuatable for
4 placing a call, the device comprising:

5 actuating means for actuating selected ones of the
6 phone keys;

7 enunciating means for enunciating sounds which are
8 indicative of the designations associated with the phone keys
9 selected;

10 commencing means actuatable for commencing entry of
11 signals indicative of the designations for placing the call at
12 a time subsequent to enunciation by said enunciating means; and
13 cancellation key means actuatable for preventing said
14 commencing means from actuating and thereby prevent commencing
15 the entry of the signal indicative of the designation just
16 previously enunciated.

1 15. A device as in claim 14, wherein said commencing
2 means is responsive to said actuating means actuating a
3 subsequently selected one of the phone keys for commencing
4 entry of the signal indicative of the designation just
5 previously enunciated.

1 16. A device as in claim 14, wherein said commencing
2 means effects commencement of said entry after a time delay
3 elapses unless prevented in response to actuation of said
4 cancellation key means during said time delay.

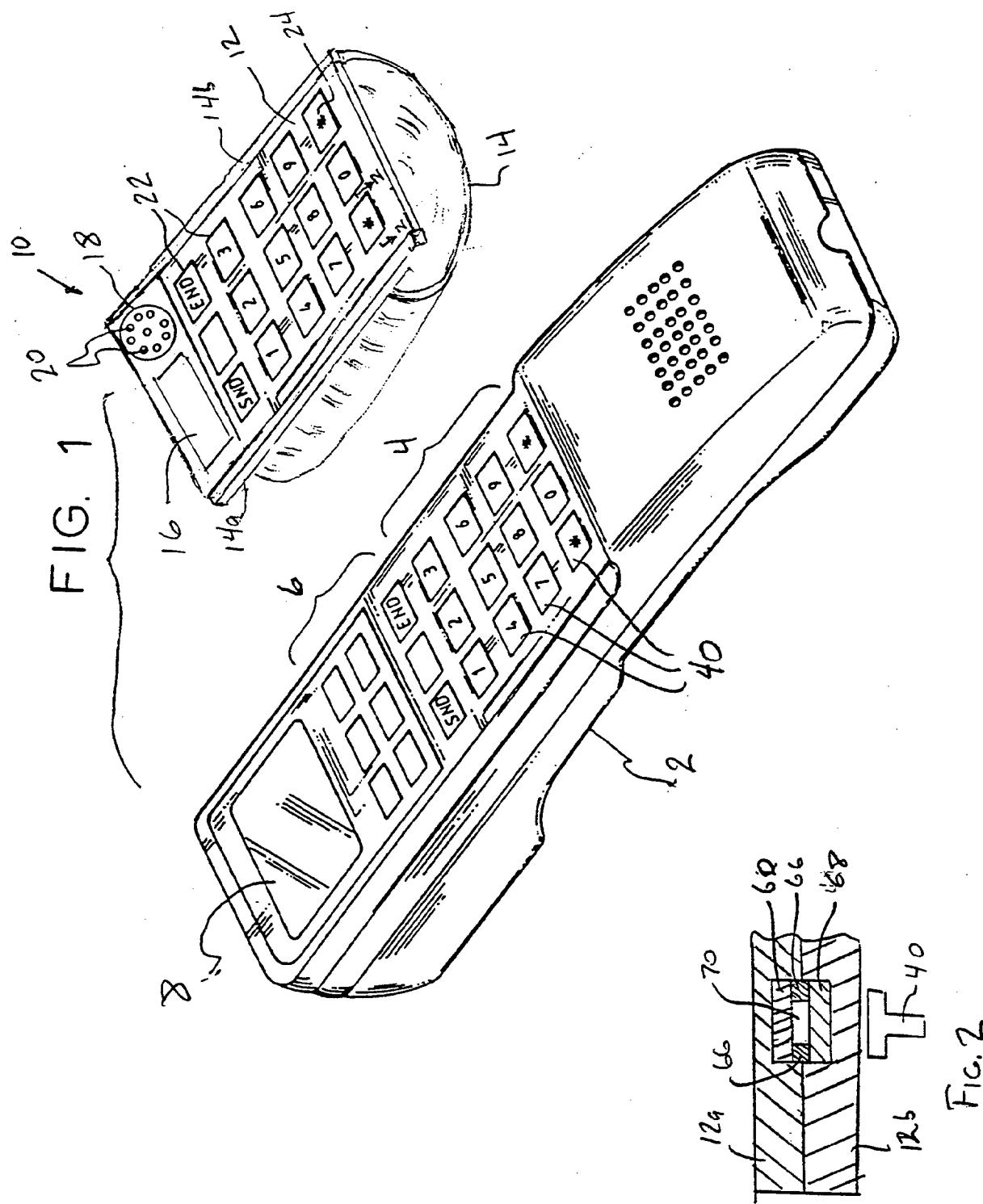
1 17. A method useful in enunciating sounds, which
2 correspond to designations associated with phone keys, of a
3 phone keypad device, the phone keys being actuatable for
4 placing a call, the method comprising the steps of:

5 actuating selected ones of the phone keys;
6 enunciating sounds which are indicative of the
7 designations associated with the phone keys selected;
8 commencing entry of signals indicative of the
9 designations for placing the call subsequent to the step of
10 enunciating; and
11 actuating a cancellation key which prevents the step
12 of commencing from arising with respect to the designation just
13 previously enunciated.

1 18. A method as in claim 17, wherein said commencing
2 step effects commencement of said entry in response to
3 actuating a subsequently selected one of the phone keys.

15
1 19. A method as in claim 17, wherein said commencing
2 step effects commencement of said entry after a time delay
3 elapses unless prevented in response to the step of actuating
4 said cancellation key taking place during said time delay.

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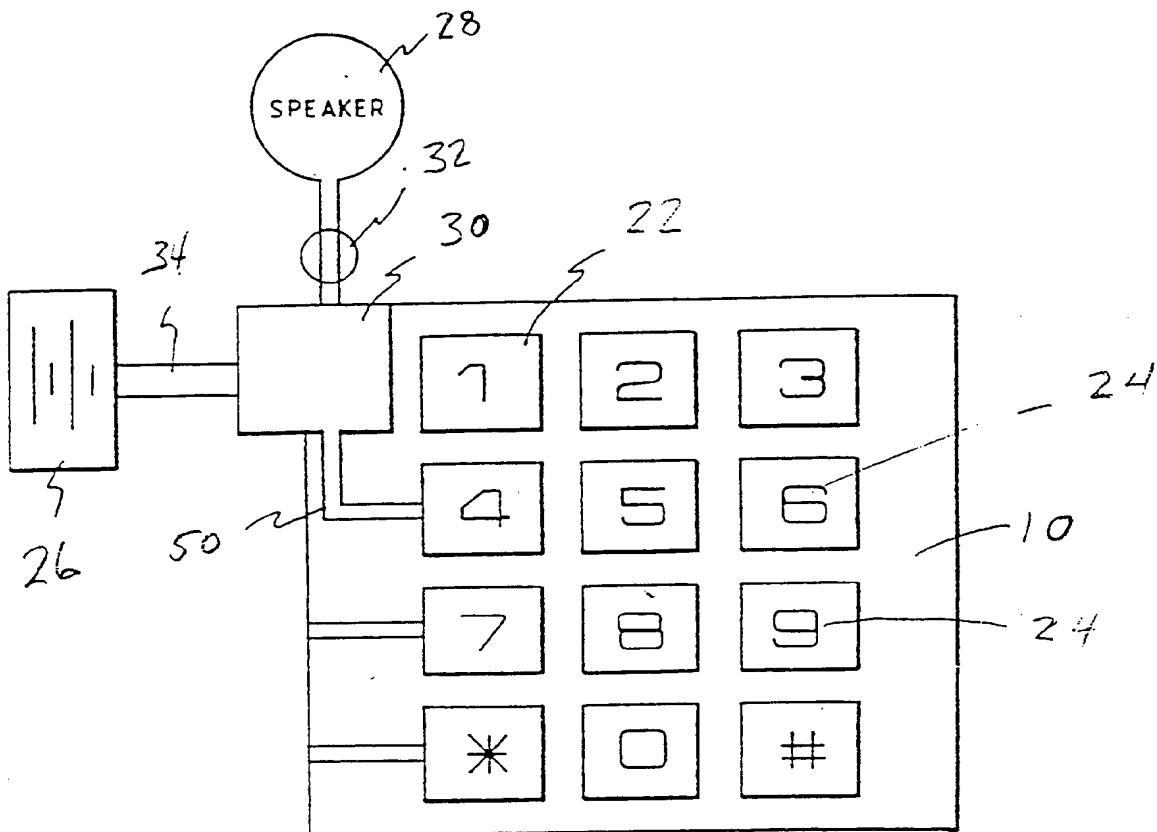
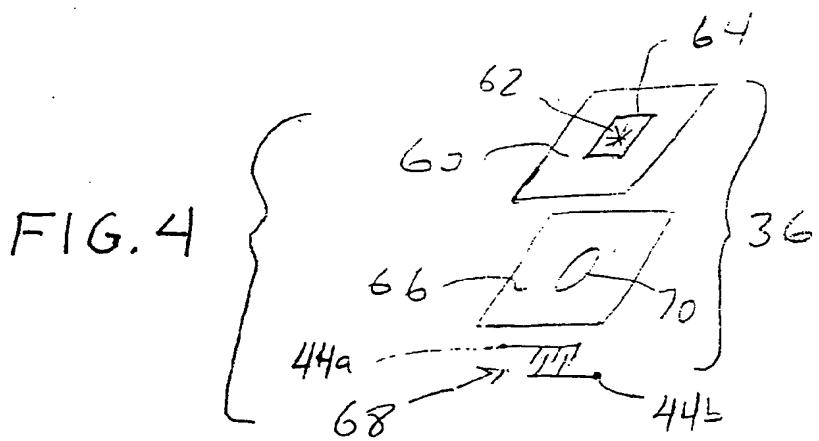


FIG. 3



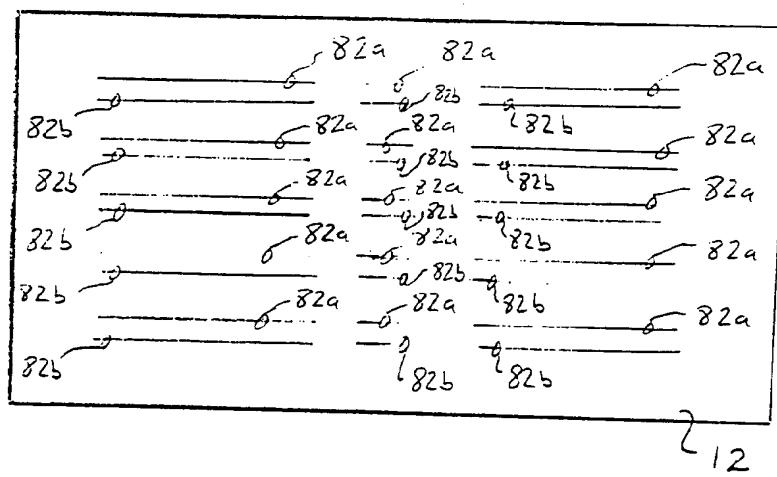
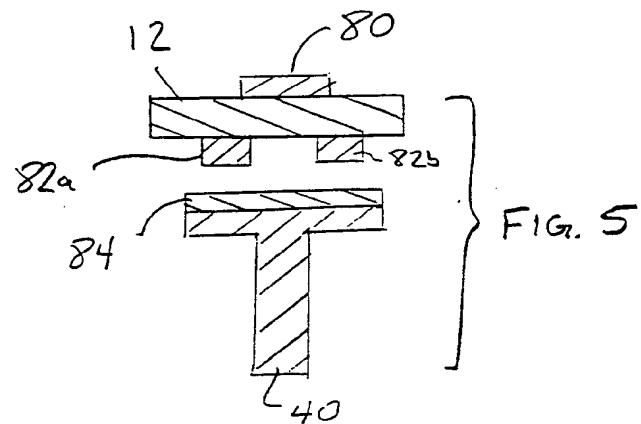


FIG. 6

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US95/02316

A. CLASSIFICATION OF SUBJECT MATTER

IPC(6) :H04M 1/00

US CL :379/447, 368, 369, 370

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 379/447, 368, 369, 370; 341/22, 27, 33; 200/517, 530, 531

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
NONE

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

NONE

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US, A, 5,140,632 (ANTEN) 18 August 1992, col. 3, lines 18-41, col. 4, lines 12-32, see also Figs. 1-4.	1-19
A	US, A, 4,412,210 (WASHIZUKA et al.), 25 October 1983, col. 4, lines 59-66.	1-19
A	US, A, 4,362,408 (CORDES et al.) 07 December 1982, col. 1, lines 25-68, col. 2, lines 1-15, see also Figs. 8-9.	1-19
Y	US, A, 4,949,374 (ISHII et al.) 14 August 1990, col. 5, lines 5-20.	1-19

Further documents are listed in the continuation of Box C.

See patent family annex.

* Special categories of cited documents:	*T*	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
A document defining the general state of the art which is not considered to be part of particular relevance		
E earlier document published on or after the international filing date	*X*	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
I document which may throw doubt on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	*Y*	document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
O document referring to an oral disclosure, use, exhibition or other means	*&*	document member of the same patent family
P document published prior to the international filing date but later than the priority date claimed		

Date of the actual completion of the international search

10 APRIL 1995

Date of mailing of the international search report

20 JUL 1995

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/US95/02316

Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This international report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

Group I, claims 1-13, drawn to a telephone attachment, classified in Class 379, subclass 447.

Group II, claims 14-19, drawn to a telephone structure or design, classified in Class 379, subclass 433.

The inventions listed as Group I and II do not meet the requirements for unity of invention for the following reasons: Group I is a telephone mechanical attachment which does not share same special technical features of Group II which describes the electrical features that include the cancellation function.

1. As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

The additional search fees were accompanied by the applicant's protest.
 No protest accompanied the payment of additional search fees.